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Fungicidal Treatments for Control of Cacao Cutting Disease in Ecuador [1]

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The long-term renovation of the cacao industry of Ecuador depends upon the gradual replacement of existing stands of unproductive and disease-ridden seedling trees with plantings of superior clones. Recent years have witnessed a great expansion of facilities in Ecuador for the propagation of clones of cacao by means of rooted cuttings. This work is being carried on energetically by private individuals and corporations and by establishments of the Ecuadorian Government. Interference with the propagation of the clones by diseases attacking the cuttings in the propagating bins would seriously retard the cacao renovation program.

Losses due to a disease of cuttings attributable to fungus and possibly other infections have occurred in the propagating bins from time to time. They have appeared in varying degrees of severity and it has not been possible to associate them positively with any one disease-producing organism. It is believed that excessive watering, improper shading, and the use of old decomposing sawdust as a rooting medium may have aggravated the losses. Extensive isolation, microscopic and inoculation studies gave few clear-cut results and it appears that the cause is a complex of factors. *Diplodia theobromae*, species of *Fusarium*, certain saprophytic nematodes, and bacteria have been found to be consistently associated with the deaths of cuttings.

Symptoms commonly noted are poor rooting, often accompanied by a brown discoloration of the base of the cuttings which, in severe cases, may be involved in a moist rot and sloughing of the bark. A spectacular yellowing of the leaves, which rapidly turn brown and absciss, often occurs. Incidence of disease may vary widely from one propagating bin to the next with 30 to over 90 percent of cuttings showing infection.

By inoculating healthy cuttings with *Diplodia theobromae* and other fungi it has been possible to inhibit or greatly reduce the formation of roots, but this did not result in the yellowing or abscission of leaves. It appears that the leaf symptoms are probably a physiological response to unfavorable environmental conditions in the bins, possibly associated with poor shade conditions and excessive watering, and that they do not necessarily result directly from fungal attack.

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[1] A contribution of the Tropical Agricultural Experiment Station of Ecuador, operated by the *Servicio Cooperativo Interamericano de Agricultura*. This work is being carried out as part of the technical cooperation program between the United States and Ecuador; the United States Government being represented by the International Cooperation Administration, IIAA, Division of Agriculture and Natural Resources.

[2] The authors wish to express their thanks to Dr. Henry Hopp, Biometrician, U.S. Department of Agriculture, for his assistance in analyzing the data.

Chemical Treatment of Cuttings

The application of protective fungicides directly to the cuttings themselves appeared worthy of serious consideration and several trials were carried out.

A number of exploratory experiments were conducted to find an appropriate method of application and the approximate range of concentrations for the chemicals. The technique of adding the chemicals in rather low concentrations to the wash water in which the cuttings were prepared worked satisfactorily (Figure 1) and was used in subsequent experiments. In contrast to other methods, the application of the chemicals in the wash water has the advantage of involving no extra operation, a feature of utmost importance under commercial conditions. While application by sprinkling with watering cans after planting would be laborious and time consuming and dipping at the time of planting would involve an extra operation and would also interfere with the hormone treatment customarily given at that time, mixing the chemical in the wash water does not interfere with the normal planting routine. Rags used, when necessary, to wipe the gummy exudate from the ends of the cuttings before the hormone treatment were soaked in the same fungicidal solution or suspension.

From the results of the exploratory experiments it was planned to test three concentrations of six fungicides in an experiment arranged in 12 replications of a randomized block design in sawdust rooting medium. Ten cuttings of cacao clone ICS 1 were included in each replicate. The fungicides tested were as follows:

Nabam-Dithane Z-78
Ferbam-Fermate
Formaldehyde-Formol
Chloranil-Spergon
Ziram-Zerlate
Mercuric chloride

Figure 1. Treatment of cacao cutting by adding fungicides into the wash water in which cuttings are prepared.

TABLE 1. – *Results of fungicidal treatments of cacao cuttings planted in sawdust rooting medium*

Treatment	Number roots per plant	Percent plants with 4 or more roots
Dithane		
0.125 %	6.74	46.7
0.25 %	6.06	60.8
0.50 %	6.84	60.0
Fermate		
0.125 %	7.62	70.0
0.25 %	8.20	68.3
0.50 %	10.09	66.7
Formol		
0.125 %	7.13	69.2
0.25 %	5.30	30.8
0.50 %	4.77	19.2
Spergon		
0.125 %	4.29	37.5
0.25 %	4.62	42.5
0.50 %	4.08	27.5
Zerlate		
0.125 %	6.35	65.0
0.25 %	6.91	66.7
0.50 %	6.97	63.3
$HgCl_2$		
0.05 %	3.87	23.3
0.10 %	3.09	10.8
0.20 %	2.93	3.3
Control (untreated)	4.96	35.8

Table 1 and Figures 2 and 3 show the effects of different treatments in terms of the average number of roots developed per rooted plant, and the percentage of plants developing at least four roots when propagated in untreated sawdust. The percentage of cuttings with four roots or more is thought to give a truer picture of the practical value of treatments than the percentage of rooted cuttings. This criterion excludes those cuttings which have only one or two small roots and which are discarded on removal from the bins. Cuttings with four or more roots would more nearly produce good trees in the plantation and would provide the propagating material useful under actual operating conditions.

The analysis of variance of the data showed the fungicide treatments to be significantly different at odds of 99 : 1. This is brought about by the combination of two factors: the definite differences in average response to the fungicides and a very high effect of the interactions of "fungicide concentrations," indicating that the response curves of different fungicides are not all similar. These effects can best be seen on the graphs in Figures 2 and 3. The least significant difference (L.S.D.) at odds of 19 : 1 is indicated on each graph.

Mercuric chloride is omitted from the figures because its effect was so toxic as to eliminate it from further consideration. As shown, Spergon failed to produce a statistically significant improvement over the control in terms of either of the measurements taken.

Formol showed significant improvement at the lowest concentration used, indicating that this material might show promise at even lower concentrations. The severe slope of the response curve shows, however, that its toxicity increases rapidly at higher dosages. The behavior of Formol in this experiment suggests that unless used with very careful supervision, it might prove dangerous since a small overdose could result in a total destruction of cuttings. The data from the Dithane treatments suggest that this chemical would probably make a good commercial treatment at the stronger concentrations.

Fermate seems to be one of the most promising, if not the best, treatment. Comparing it with the untreated control it shows substantial improvement at all concentrations and it was found to be a relatively safe fungicide for cacao cuttings. The general increase of good rooting over the whole range of concentrations used is an important factor since it permits desirable flexibility in preparation. If, therefore, a concentration of 0.25 percent be recommended as a commercial treatment, errors in mixing would be expected to have no measurable effect, and would certainly not result in a catastrophe, as would an overdose of formaldehyde, or in a failure to take effect, as might an underdose of Dithane.

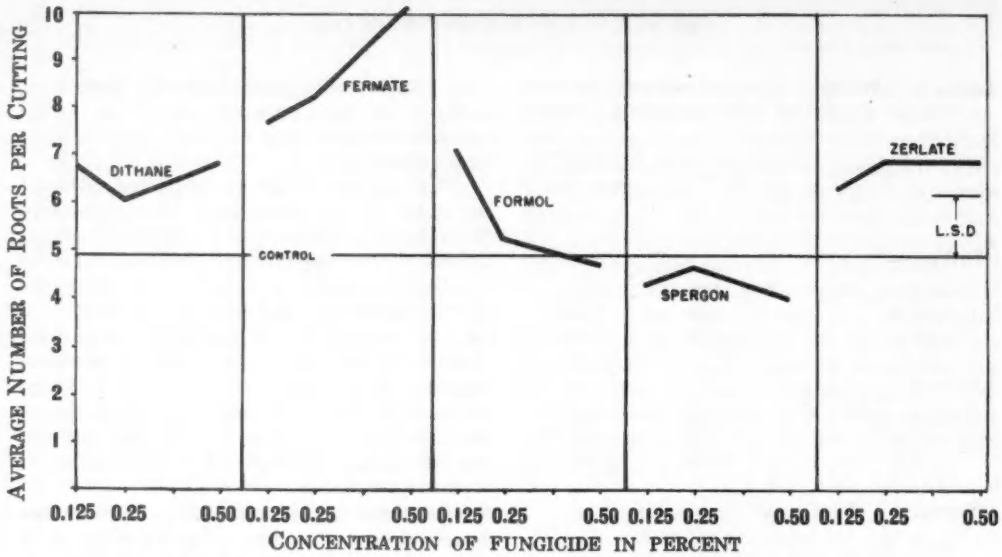

Figure 2. Effect of fungicidal treatments on the number of roots developing on each rooted cacao plant when propagated in untreated sawdust.

Zerlate is also a promising fungicide which produced a marked good effect at all of the concentrations used. In utilizing this material it would not be necessary to exercise extreme care in mixing.

Although Fermate performed slightly better than Zerlate, the difference is not statistically valid and it would be difficult to distinguish between them.

Summary

Highly significant increases in the rooting of cacao cuttings and in the number of roots

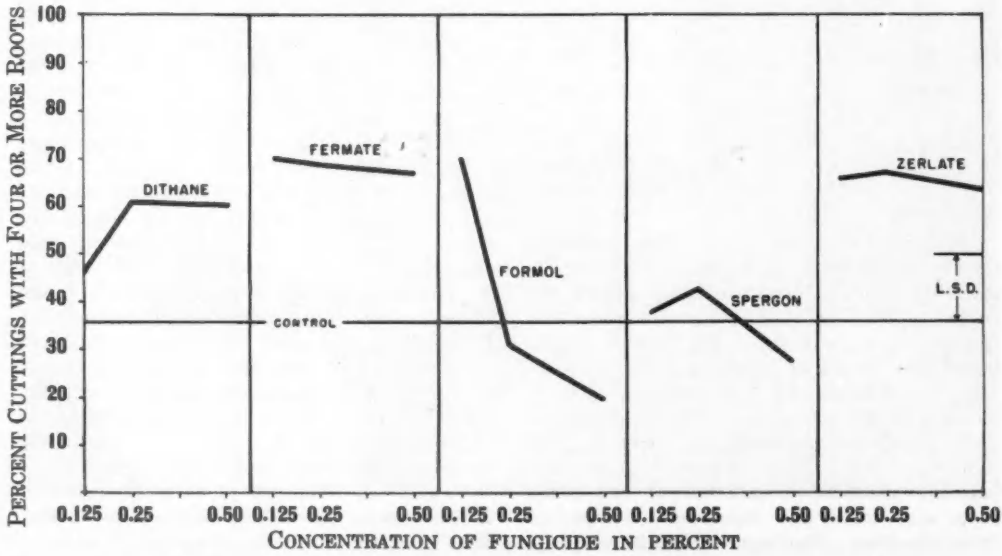

Figure 3. Effect of fungicidal treatments on the percentage of cacao cuttings with four or more roots when propagated in untreated sawdust.

developing on the cuttings were obtained with fungicides applied to the water in which the cuttings were prepared and transported to the cutting bins. Of the fungicides used, Fermate and Zerlate were found to be the most satisfactory, with Dithane appearing in second place. Spergon proved ineffective at the concentrations used and Formol showed promise at the lowest concentration but displayed such toxicity at somewhat higher concentrations that it is considered too dangerous for commercial use. Mercuric chloride proved extremely toxic at all concentrations tested.

Fermate and Zerlate are considered the fungicides of choice since they gave effective results over a wide range of concentrations. Treatments of Fermate or Zerlate at 0.25 percent, or Dithane at 0.50 percent, applied in the wash water in which the cuttings are prepared, are recommended.

A Correction

In the article "Effects of rainfall on the incidence of Monilia pod rot of cacao in Ecuador" by Russell Desrosiers, Angel von Buchwald and Carlos Bolaños, published in this Bulletin Vol. III, No. 11, the following should be added to the legend of Figure 1 on page 163:

"The solid line denotes incidence of Monilia pod rot; the broken line denotes the amount of rainfall during the early stages of pod formation."

The Need for More European Cooperation in the Study of Virus Diseases of Fruit Trees

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ALTHOUGH much research has been done on virus diseases of a very wide range of cultivated plants, the virus diseases of fruit trees have not been thoroughly studied in Europe yet. No doubt this is partly due to the difficulties that have to be overcome in studying these diseases. For instance, owing to their growth habit and size, much time and space are needed in carrying out researches on fruit trees. During the last five years more attention has been paid to the symptomatology of virus diseases of fruit trees because some of these diseases were found to have great economic importance. This article attempts to summarize the main problems involved and give an outlook on the future developments which will be required to better our knowledge in this field.

Survey of Known Diseases

In various European countries a number of virus diseases of fruit trees has been described. Apple trees seem to contain the greatest number of viruses. On this fruit, mosaic, rubbery wood, flat limb, proliferation, rosette and rough skin are the diseases of virus origin known to occur in Europe.

Mosaic of apple, caused by *Pyrus* virus 2 K.M.Sm., is known in almost every country. It seems to be due to one virus, which can occur in several strains (24).

Rubbery wood was first found in England (15,26) and its presence was also reported in Holland (9,19), France[1], Denmark (27), Norway (28) and Switzerland (5).

Flat limb is a rather rarely occurring virus disease that attacks apparently only few apple varieties severely. In Denmark "flat limb" of variety Gravenstein has been proved to be due to a virus (27). The same disease occurs in Italy on varieties Gravenstein and Abondanza and in Holland on Abondanza. In Norway it affects mainly Gravenstein and is occasionally observed on James Grieve, Filippa and Signe Tillisch (28).

The proliferation disease was first found in Italy, where it is known as *scopazzi del melo* (29). Later this disease was also found in Switzerland, where it is called *Hexenbesen* (4) and in Holland, called "proliferation" (18). This disease is characterized by the proliferous development of side buds on water shoots and the abnormal enlargement of the stipulae of spur leaves. The disease is too rare to have any economic importance.

A rosetted condition of apple trees has been found in some instances by van Katwijk (8) in Holland. This rosette disease occurs only very rarely on Belle de Boskoop trees. According to van Katwijk transmission by grafting has been observed.

Recently a virus disease of great economic importance was found on apple trees which produce fruit with a rough skin. In Holland, van Katwijk (11) has proved this rough skin disease to be a virus disease and accompanying leaf symptoms were found by the writer (21). The affected fruits show cracks and corky spots on the skin and can easily be distinguished from those that have a completely corky surface due to a genetic abnormality. Earlier the rough skin condition of apples had been described in Denmark as *Smaa revner*, in Germany as *Stiletschaden* and in Switzerland as *Korkflecken*, but without being identified as a virus disease.

In pear trees some virus diseases are known, but little can be said about their occurrence in different countries. Stony pit has been found in Holland (17), in Denmark (27) and in Switzerland (5). Mosaic symptoms on pears can be differentiated into different types, partly due to the different reaction of varieties.

[1] Personal correspondence to the writer.

In Holland, van Katwijk (10) described three types of mosaic. One of these, veinlet chlorosis, seems to be connected with stony pit. It is not clear whether the other two, mosaic and ring pattern, are due to different viruses or only to the different reaction of varieties to the same virus. Posnette and Harris (25) described a vein-banding and a leaf flecking of pear leaves in England. Thus far, pear trees have been rather healthy compared with apples and the above-mentioned diseases seem to be of little economic importance.

In contrast with this, cherry trees throughout Europe are heavily infected by virus diseases. In Switzerland, Blumer (3) described the Pfeffinger disease of sweet cherry. In England, several diseases of cherries have been described (23), such as raspleaf, necrotic ringspot, rusty mottle, tatter leaf, rosetting, dusty yellows, leaf roll etc. It is not yet known which of these occur on the Continent. In Holland, the Pfeffinger disease was also found and described under the name of Eckelrader disease (16). Furthermore, ringspot on sweet and sour cherries has been described (19, 20). In Germany, Thiem (31, 32) described a number of virus-like symptoms on cherries and Kotte (12) noted the occurrence of Pfeffinger disease on sweet cherry.

On plum trees there occurs a common type of mosaic that has already been known for a long time (1). More recently, Po nette (22) described six virus diseases of plums in England: leaf roll, bark split, plum pox, prune dwarf, line pattern and ringspot, of which the line pattern is probably identical with the commonly occurring mosaic.

Plum pox has been described earlier by Atanasoff (2) in Bulgaria and by Josifovic (7) in Yugoslavia. This disease is of great economic importance in these two countries, but did not seem to occur in the western part of Europe until Posnette found similar symptoms on plums in his experiments in England.

The common plum mosaic has been reported in Holland, Switzerland and Denmark. Prune dwarf occurs in Switzerland, Holland and England. The symptom of bark split has also been seen by Posnette in Holland and by the writer in Switzerland, so this virus disease must be widely spread in Europe.

Peaches seem to be more healthy in Europe than in the United States. The common virus disease of peaches in Europe has been called mosaic, but it does not seem to be identical with the American peach mosaic as it does not cause severe stunting. Krythe (13) described a European peach mosaic in Holland and proved its identity with the mosaic of line pattern of plum. Apparently the same disease occurs in France (1). Slightly different symptoms characterize a mosaic disease in Italy (6). Scaramuzzi (30) also found peach trees in Italy affected by willow leaf disease.

This is only a very short and incomplete summary of the many cases of virus diseases already discovered. Doubtless there are still many to be discovered in those countries.

Spread of Fruit Tree Viruses

Hitherto virus diseases of fruit trees have been spread mainly by the wood itself. Only in the case of the plum pox disease in Bulgaria and Yugoslavia, shown by Atanasoff (2) to be transmitted by *Anuraphis padi*, has insect transmission of a fruit tree virus in Europe been reported. In contrast to this finding is the observation that in Yugoslavia healthy and diseased plum trees can be near each other for twenty years without transmission taking place. This may be due to different climatic conditions.

It can therefore be concluded that at the present time insect transmission plays no known role in the spread of fruit tree viruses in Europe. These diseases are mainly spread by man himself through the movement of rootstocks and grafts and budwoods for scions. It must, however, be kept in mind that very little research has been done on the subject of insect transmission. Posnette (23) reported the spread of tatter leaf virus in cherry orchards in England without indicating the way in which the disease spreads.

Apart from that, there are indications that in some cases a virus may spread through the soil. The Pfeffinger disease and the probably identical Eckelrader disease in Holland both spread in an orchard from tree to tree but did not pass a road or a canal.

The fact that spread does not seem to take place by means of insect vectors is of great importance for those who study these diseases and select virus-free rootstocks and scion material. Where insect transmission occurs, diseased and healthy trees which are

used for research should be well separated. However, in the absence of evidence about such means of spread, research and selection may be done in the same place, as is the case at the East Malling Research Station in England.

Future Cooperative Research in Europe

The comparison of symptoms of virus diseases on fruit trees and other kinds of host plants used as indicators is of the greatest importance as there is at present no other useful means of identification of fruit tree viruses. Serological reactions are impossible because no one has succeeded in making antisera, apparently because of the tannin substances in the plant sap. The colorimetric test for detecting cherry and plum viruses, described by Lindner *et al* (14), has not been found useful by workers in England and Holland. Also the method of characterizing a virus disease by the ultra-violet absorption spectrum of the plant sap seems to fail as a means for identification. The most promising technique is that of transmitting the fruit tree viruses to other, smaller and more rapidly growing host plants such as cucumber to which Duain Moore transmitted some viruses of cherry and plum.

More research on this subject is urgently needed and more international cooperation necessary, especially in relation to the propagation of fruit trees in nurseries. As each new virus is described, suspicion between importing and exporting countries increases. In order to promote better understanding on those viruses, symptoms should be compared and plant materials, especially indicator plants, exchanged.

During the Symposium on virus diseases of fruit trees held at Wageningen, Holland, 24-27 August 1955, it was recommended that the exchange of indicator material should be one of the first things to be stimulated by the Permanent European Committee for Research on Virus Diseases of Fruit Trees nominated by the Symposium. This will enable research workers in different countries to compare symptoms of diseases on the same indicator plant. Furthermore this committee will encourage and undertake the organization of symposia in various countries whenever the usefulness of such meetings seems evident in relation to the amount of research done and the importance of virus diseases on fruit trees in those countries. A handbook on European fruit tree virus diseases will be compiled by the Committee as soon as sufficient material becomes available. Close cooperation will be maintained with North American specialists who are at a much more advanced stage in researches in this field and such cooperation will undoubtedly be of great value to the promotion of similar researches in Europe.

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Plant Disease Situation in the United States [1]

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Aster Yellows on Ornamental Plants

PHILIP Brierley and Floyd F. Smith, of the United States Department of Agriculture, Agricultural Research Service, report that pansies (*Viola tricolor*) used as bedding plants on the grounds of the Plant Industry Station, Beltsville, Maryland showed yellows symptoms at flowering time, in April 1954. Vein-clearing and bright yellow chlorosis of leaves were prominent (Figure 1). Flowers were not streaked or distorted, but were smaller than normal ones. Incidence of the disease over the whole planting was estimated at only 1 to 2 percent, but appeared much higher because of the conspicuous yellowing of affected plants. The aster yellows virus was transmitted from those pansies to China aster by the vector *Macrosteles fascifrons* (Stal.). Hoppers were not found on the pansy plants in April. Infection is believed to have occurred in the previous autumn, after the plants were transplanted from a greenhouse in September.

A single plant of the florists' hydrangea (*Hydrangea macrophylla*) variety Charm, showing vein-clearing in a young side shoot and proliferation of pistils into vegetative shoots (Figure 2) was received from Oregon in May 1954. The aster yellows virus was transmitted from this plant to China aster by *Macrosteles fascifrons*. High temperatures

[1] This report is based upon material submitted by Collaborators of the Plant Disease Epidemics and Identification Section, Agricultural Research Service, United States Department of Agriculture.

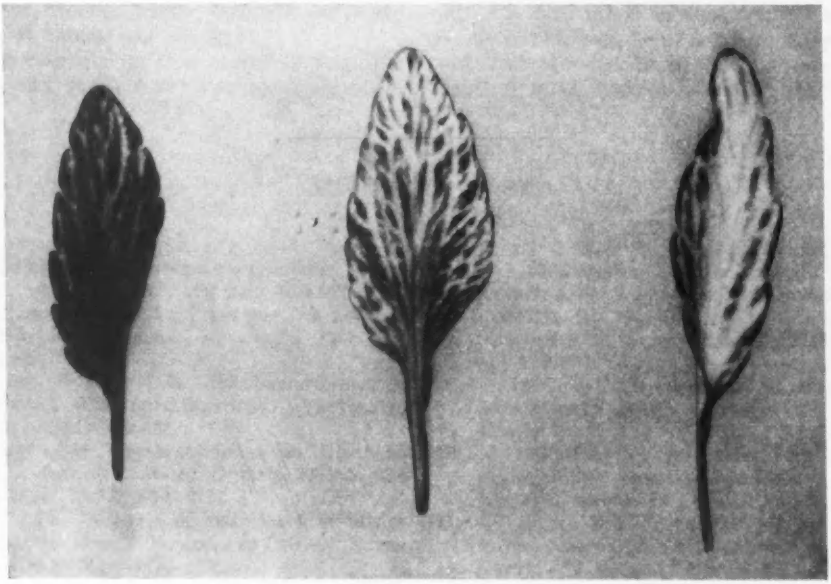

Figure 1. Aster yellows symptoms in pansy.

prevented determination of the strain of aster yellows virus involved. The affected plant declined steadily and died, indicating that this virus is lethal to hydrangea. The Oregon grower, who had purchased dormant plants from California, reported that only 2 of 15,000 plants showed yellows symptoms.

Imported Cherry Seed as a Carrier of Necrotic Ring Spot Virus

R. H. Gilmer, of the New York State Agricultural Experiment Station, reports information showing that the necrotic ring spot virus, or a virus capable of causing symptoms in cucumber plants indistinguishable from those caused by necrotic ring spot virus, occurs in Europe and may be imported into the United States in seeds of mahaleb cherry (*Prunus mahaleb*).

During the course of routine seed treatment tests undertaken at Geneva, New York State, a lot of mahaleb cherry seeds labeled "French imported" was obtained from a local nursery grower. These seeds were planted in the field in October 1954, and

Figure 2. Aster yellows symptoms in hydrangea, showing green sepels, apparently normal stamens and pistil proliferated to form a green shoot with two leaves and a bud.

about 42 percent of them emerged in May 1955. The seedlings were vigorous and normal in appearance.

Two hundred seedlings of this lot were indexed by the cucumber method. Extract was taken from one or two partially expanded terminal leaves in each seedling and was rubbed on the cotyledons of four Chicago Pickling cucumber plants. Of the 200 mahaleb seedlings tested in June, 32 transmitted a virus to one or more cucumber plants. Repetition of trials with the same plants in mid-July gave lower percentages of transmission. Symptoms exhibited by the cucumber plants were indistinguishable from those produced by an extract from peach infected with necrotic ring spot virus.

Flowering Cherries as Carriers of a Virus of Little Cherry Type

Kwanzan and Shiro-fugen oriental flowering cherries (*Prunus serrulata*) are used extensively as test plants for ring spot viruses in stone fruits. The clones of these varieties which have been widely employed for such tests were assumed to be free from latent type viruses since they grew normally and induced no foliage symptoms or abnormal growth in the commonly used indicator plants. However, recent cooperative studies made by E.L. Reeves and Philip W. Cheney of the U.S. Department of Agriculture, Agricultural Research Service, and J.A. Milbrath of the Oregon Agricultural Experiment Station, have shown that when these particular clones of Kwanzan and Shiro-fugen were budded into or grown on fruiting sweet cherry trees, a serious small fruit condition developed. The evidence obtained shows that these clones carried a little cherry-type virus that caused fruit symptoms on Lambert and Bing sweet cherries.

In Washington, the small cherry symptom was observed from 1953 to 1955 on Lambert and in 1955 on Bing sweet cherry trees that had received buds from Kwanzan or Shiro-fugen trees maintained for use as test varieties for other viruses. The Kwanzan employed was a third generation propagation from a budwood source originating in Oregon. Two sources of Shiro-fugen were used: one came directly from Oregon as budwood and the other was a third generation propagation from a budwood source originating in Oregon. The budding was made on 3 Lambert trees in 1949 and on 20 Bing trees in 1949 and 1953. The symptoms became apparent when the sweet cherry trees first produced fruit, in 1953 on Lambert and in 1955 on Bing.

Symptoms were confined to fruits. Growth and foliage were apparently normal. At harvest time Lambert fruits on affected trees were not only small and lacked color, but were more pointed and angular than normal fruits and many were three-sided, tapering toward the distal end. Affected Bing fruits were similarly tapered but were less angular. The three Lambert trees and eight of the affected Bing trees produced a good crop of fruit in 1955, while the remaining Bing trees had only scattered fruits. Regardless of the number on affected trees, fruits were all small as compared with those on unaffected check trees propagated from the same bud-wood sources and on similar rootstocks.

The histories of the Bing and Lambert sweet cherries and the Kwanzan and Shiro-fugen flowering cherries are known for several years. The Lambert variety has been used locally at Wenatchee, Washington, but propagations of the three other varieties have been employed by other research workers in most of the western States. By all previously recognized biological tests the Bing, Kwanzan, and Shiro-fugen gave negative reactions when tested for latent-type virus diseases. The Lambert selection gave a negative test for a latent ring spot-like virus when indexed on Kwanzan and a positive test when indexed on Shiro-fugen.

The affected Bing trees that received Shiro-fugen buds were grown on either mazzard or mahaleb root-stock. The Lambert trees were propagated by top-grafting the variety in 1948 on to arms of mahaleb seedlings previously planted in the field in 1947. Buds of Kwanzan were placed in only two Lambert branches of each tree in 1949 while the other Lambert branches on the same tree received no Kwanzan buds. The root-stocks employed and the methods of handling them apparently did not influence symptom expression. Also on the Lambert trees branches that did not receive Kwanzan buds showed just as good fruit symptoms

as those that did receive buds, indicating that the virus passed through the mahaleb stock.

Two of the Lambert trees have had all Kwanzan growth removed from them for 1 year and five of the 20 Bing trees have had no Shiro-fugen branches growing on them since they were planted in the field in the spring of 1951. The presence or absence of growing branches of Kwanzan or Shiro-fugen on the sweet cherry trees has apparently not influenced the expression of small fruit symptoms.

In Oregon, after this little cherry-type symptom had been observed in Washington, buds from the original source tree of the Kwanzan from which the Washington stock had been obtained and three other Kwanzan source trees in the Oregon plots were each placed in August 1954 on three Lambert trees of fruiting age. The following July, all 12 Kwanzan-budded Lambert trees showed some abnormally small fruit indicating transmission of a virus. When the fruits on the Lambert check trees were the normal dark reddish-black color, occasional fruits on the inoculated branches were still small and red, and somewhat angular in shape due to two depressed areas near the apical end of the fruit on the opposite side from the suture. Other affected cherries were larger and darker in color but also showed the depressed areas. As the fruit ripened the depressions often were lighter red in color with loose wrinkled skin. The appearance of affected fruits is as if the side opposite the suture near the apical end had been pressed with the thumb and forefinger. Fruits near the boundaries of the infection were nearly normal in size but were slightly flattened near the apical end of the fruit opposite the suture.

The virus appeared to spread quite rapidly through the tree. Besides affecting fruits on the inoculated branches, symptoms were noted on some of the adjacent branches approximately 11 months after budding.

The observations reported above indicate that at least some stocks of the apparently healthy flowering cherries which have been used as test plants are carrying a virus potentially dangerous to sweet cherries. Search should be made for virus-free sources of these valuable test varieties.

This virus carried by the Kwanzan and Shiro-fugen varieties of flowering cherries produces little cherry-type symptoms suggestive of those of the little cherry disease, so far known to occur only in the Kootenay area of British Columbia. In the Kootenay area little cherry has spread very rapidly during a period of 20 years and has become nearly universal, affecting all commercial varieties of sweet cherries and seriously reducing both size and quality of the fruit.

The small fruit symptom is suggestive but is not sufficient for identification by itself. Further studies will be needed in order to determine the identity of the virus carried by Kwanzan and Shiro-fugen flowering cherries. In this connection, it should be noted that while the fruit symptoms observed on sweet cherry in Washington appear to be identical with those of little cherry, affected fruits in Oregon seem to be characterized by the bilateral depressions on the side opposite the suture. The virus appears to affect sweet cherry on either mahaleb or mazzard root-stock and, like the little cherry virus, passes through mahaleb from one arm to another in doubleworked trees. In Washington there is no evidence of natural spread in experimental plots even though infected flowering cherry trees have been maintained for several years adjacent to uninfected sweet cherry trees.

Outbreaks and New Records

Canada

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Sugar Beet Wireworm

THE sugar beet wireworm, *Limonius californicus* Mann., severely infested a six-acre field of sugar beets at Turin, Alberta, in 1954. The crop was on low-lying, irrigated, alkaline soil. It was estimated that the stand of beets was reduced 45 to 50 percent. The severity of the damage and the fact that wheat grown on the land had been thin and patchy for three consecutive years indicated that the insect had been established for a considerable time. A survey of beet fields in the immediate vicinity failed to reveal any other infestations of the species. This is the first record of economic damage by the sugar beet wireworm in Alberta.

A Chrysomelid on Sagebrush

A heavy infestation of *Trirhabda pilosa* Blake (Coleoptera: Chrysomelidae) occurred in stands of sagebrush (*Artemisia tridentata*) during July 1954 in the Jacko Lake area near Kamloops, British Columbia. The infestation spread over approximately eight square miles of open hill country at elevations of 2,500 to 3,500 ft. Extensive damage was done to leaves of host plants and a 15-acre stand of sagebrush was completely defoliated. New-generation adults were abundant on the host plants during August and a few were observed to be active as late as 26 October. There appears to be no previous authentic record of the occurrence of this species in this Province.

United Kingdom

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Ips cembrae: a First Record

The eight-toothed larch bark beetle, *Ips cembrae* Heer, has been recorded for the first time in Britain. The first notification came from Monaughty Forest, in Morayshire, and preliminary surveys have revealed that it is established as a breeding species in six other localities in the north-east of Scotland. It is not known how the beetle entered the country, or for how long it has been established. Possibly it was imported in 1946 along with *Ips typographus*, with which it can be confused, when large numbers of that species arrived in Britain on consignments of German spruce.

Plant Quarantine Announcements

France (Overseas Territories)

Decree No. 55-1219 of 11 September 1955, published in the *Journal Officiel* No. 220, 17 September 1955, contains regulations governing conditions for the application of Law No. 52-1256 of 26 November 1952 relating to the organization of plant protection in territories under the jurisdiction of the French Ministry of Overseas Territories (see FAO Plant Prot. Bull. 1 : 77. 1953).

The 3rd part of the Decree concerns importation and exportation. Plants, parts of plants, seeds, manures, composts and all packing materials used for their transport may not be introduced into the overseas territories and territories under French trusteeship, unless the consignment is accompanied by a phytosanitary certificate issued by the competent authority of the country of origin attesting its freedom from all parasites. Plant material capable of spreading dangerous parasites, when used for packings, is subject to the same restriction.

The import of all these products is subject to the control of the plant protection service which has the sole authority in deciding whether the products should be admitted, refused, quarantined or otherwise treated. Under certain specific conditions laid down by the service, the products mentioned above may be imported without the required phytosanitary certificates or disinfestation.

The plant protection service is also responsible for the control of the export of plant materials and for the issuance of phytosanitary certificates to accompany the consignments.

Netherlands

Decree No. JZ/L 14.552/84 of 26 September, issued by the Minister of Agriculture and published in the *Nederlandse Staatscourant* No. 187, 27 September 1955, amends Decree No. 10.764/84 of 1 April 1954 relating to conditions governing the importation of potatoes (see FAO Plant Prot. Bull. 2 : 124.1954). Under the new Decree, consignments of potatoes intended for import must have been examined in the country of origin and found to be free from ring rot (*Corynebacterium sepedonicum*), as well as black wart disease (*Synchytrium endobioticum*). Other requirements remain the same.

News and Notes

Portugal Ratifies the International Plant Protection Convention

The Government of Portugal, whose representative signed the International Plant Protection Convention on 6 December 1951, deposited the instrument of ratification with the Director-General of FAO on 6 October 1955. The number of countries contracting to the Convention, including both signatory and adhering members, is thus, at the time of writing, thirty-one, namely: Argentina, Australia, Austria, Belgium, Cambodia, Canada, Ceylon, Chile, Denmark, Dominican Republic, Egypt, El Salvador, Greece, Guatemala, India, Iraq, Ireland, Italy, Japan, Korea, Laos, Luxembourg, Netherlands, New Zealand, Pakistan, Republic of the Philippines, Portugal, Spain, Sweden, the United Kingdom and Yugoslavia.

European and Mediterranean Plant Protection Organisation

The latest report on the activities of the European and Mediterranean Plant Protection Organisation (EPPO), which was published in the August issue of this Bulletin, outlined the position up to May 1955. It referred *inter alia* to an international conference on potato root eelworm which was held in Wageningen, Holland, on 6 July 1955. The report of this meeting has just been published. It contains recommendations regarding the steps which should be taken to control infestation within a country, and also the phytosanitary restrictions which governments would be justified in taking as a safeguard against introduction of the pest from outside. A strong plea is made for reasonableness in framing and administering import restrictions. "It is reasonable," states the report, "that imports should not be noticeably infested, but it is unreasonable to require a declaration certifying complete freedom from potato root eelworm, since this cannot possibly be guaranteed, even by the most efficient control program of the exporting country."

The reports of the EPPO Working Parties which dealt respectively with the simplification and unification of phytosanitary regulations and with the San José scale were published in May and July 1955. A further meeting of the former Working Party will be held in Rome in December 1955. The following technical meetings are planned for 1956:

1. A Working Party on tristeza and xyloporosis, serious virus diseases of citrus.
2. An international conference on the Mediterranean fruit fly (*Ceratitis capitata*).
3. An international conference on the fall webworm (*Hyphantria cunea*).
4. A Working Party on insects and pests of stored foodstuffs.

A meeting was held in Kassel, Germany, on 13 October 1955, attended by representatives of Denmark, Sweden, the Federal Republic of Germany and the Democratic Republic of Germany, when the progress of the special campaigns of muskrat and Colorado beetle control in Schleswig-Holstein was reviewed. There were no outbreaks of Colorado beetle in Danish potato crops in 1955. The muskrat position is somewhat disturbing, as the pest has been found north of the Kiel canal. A special control effort is being made in that region.

In collaboration with EPPO, the French Ministry of Agriculture is convening a conference in Paris on 1 December 1955, to discuss the incidence and control of Colorado beetle in the various regions of France. The governments of countries to whom the control of Colorado beetle in France is of special interest will be invited to send representatives to this meeting.

Roma - Tip. del Senato del dott. Giovanni Bardi